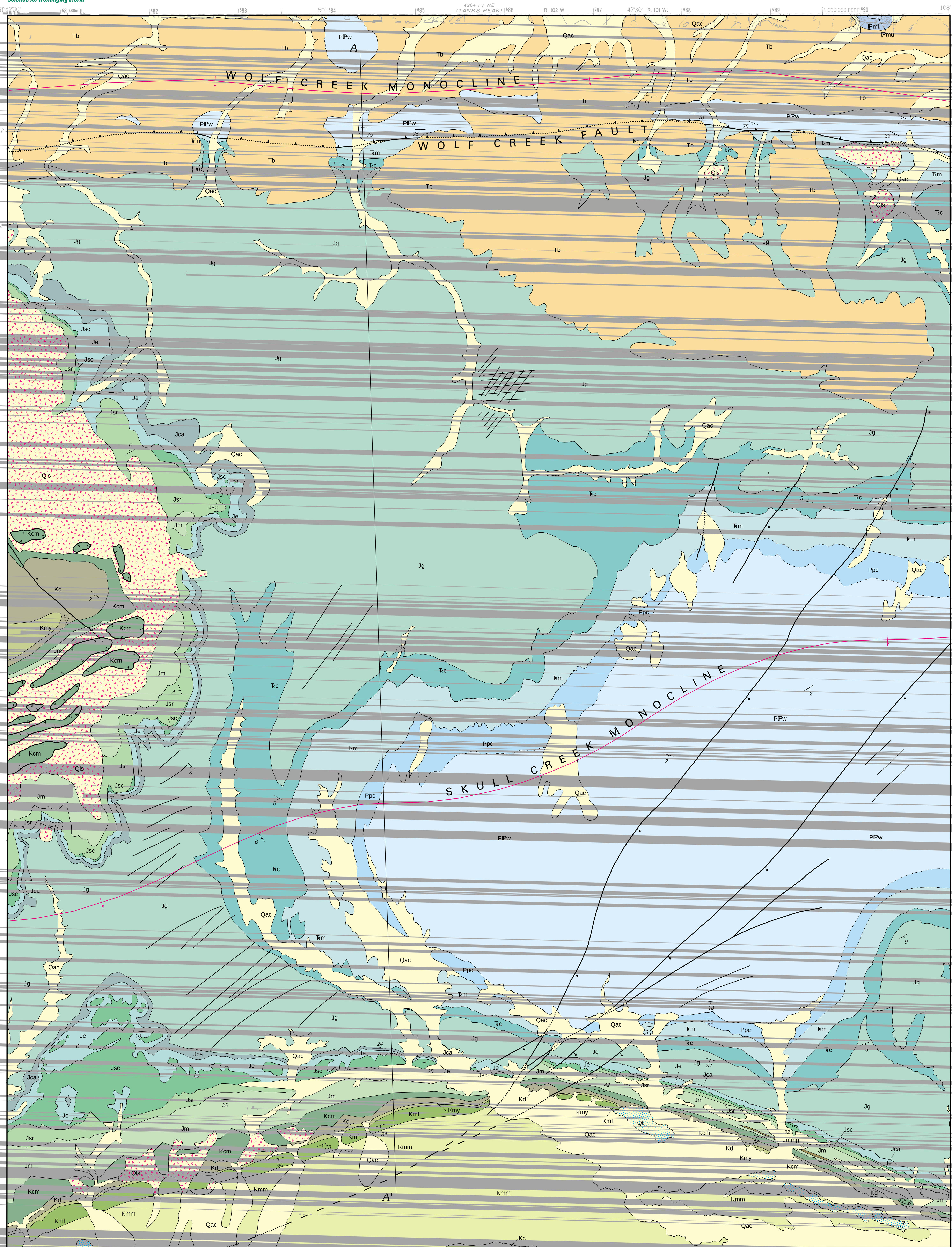


Base from U.S. Geological Survey, 1962.
Polyconic projection. 1927 North American datum.
10,000-foot grid based on Colorado coordinate system, north zone
1,000-meter Universal Transverse Mercator grid ticks, zone 12

APPROXIMATE MEAN DECLINATION, 1962

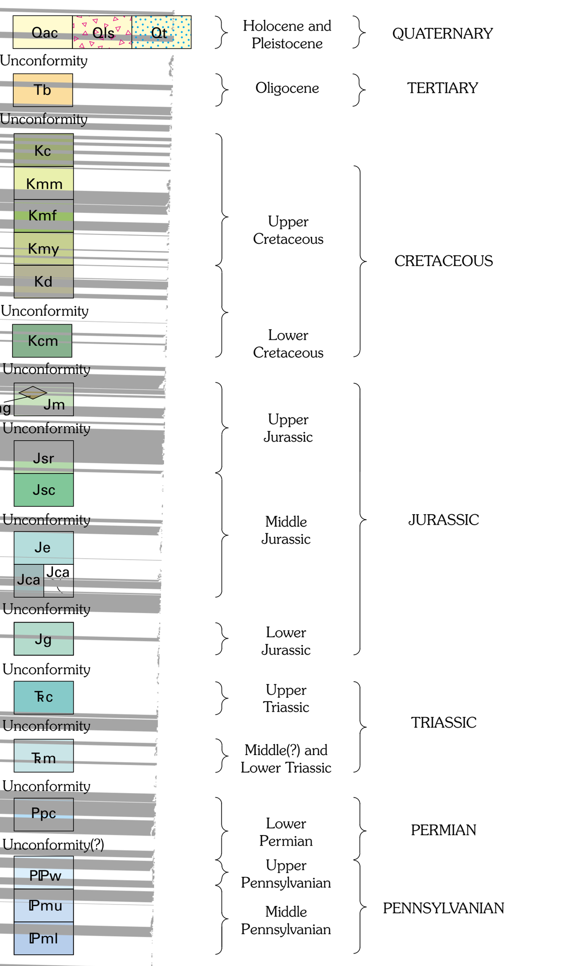
SCALE 1:24 000

CONTOUR INTERVAL 40 FEET
DOTTED LINES REPRESENT 20-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

MAP AREA

Geology mapped 1988-89
Edited by Diane E. Lane
Color design by Virginia Scott
Digital cartography by R.E. Van Loenen, Gary Selner, and Diane E. Lane
Manuscript approved for publication June 3, 1998

CORRELATION OF MAP UNITS



DESCRIPTION OF MAP UNITS

Qac **Alluvium and colluvium (Holocene and Pleistocene)**—Unconsolidated, poorly sorted clay, silt, sand, gravel, and rock fragments deposited in and along present stream channels and as slope-wash deposits at base of slopes and cliffs around Skull Creek Dome. Older alluvial deposits of mostly red clay, silt, and sand occur in and adjacent to present stream channels, are as thick as 80 ft, and are dissected by present drainage system. Contact transitional with other surficial deposits

Qls **Landslide deposits (Holocene and Pleistocene)**—Poorly sorted debris from unstable shales of Cedar Mountain Formation. Deposits accumulated in water gaps cut in hogbacks near Blue Mountain, Colo. Landslides dominate slopes of Moose Head Mountain. Large slump blocks, some nearly 1 mi across, of the hard Cedar Mountain Formation have been rafted down slope along glide faults on slick clays of Morrison Formation

Qt **Terrace deposits (Holocene and Pleistocene)**—Unconsolidated, poorly sorted sand, gravel, pebbles, and cobbles of mainly quartzite along southern part of quadrangle. Maximum thickness about 100 ft

Tb **Bishop Conglomerate (Oligocene)**—Poorly consolidated, light-gray, yellowish-brown, or white, thin-bedded, poorly sorted pebble, cobble, and boulder conglomerate. Matrix is locally tuffaceous. Clasts consist mostly of red quartzitic sandstone derived from Uinta Mountain Group (Middle Proterozoic) and light- to dark-gray limestone derived from Paleozoic formations. Soluble coatings of calcium salt on boulders make the Bishop terrane look white. Thickness varies from a few feet to tens of feet

Kc **Castlegate Sandstone (Upper Cretaceous)**—Forms hogback couplet in sec. 11 at south edge of map. Upper part is yellowish-gray, very fine grained sandstone; contains concretions; about 80 ft thick. Lower part is gray shale and silty shale grading downward into orangish-brown, thin-bedded, fine-grained sandstone; basal 10 ft is indurated sandstone that forms northern hogback of couplet at south edge of quadrangle. Total thickness about 200 ft

Mancos Group (Upper Cretaceous)

Kmm **Main body**—Brownish-gray, mostly noncalcareous, marine shale interbedded with minor siltstone, very fine grained sandstone, and thin bentonite beds. Lower part is poorly exposed at base of hogback formed by Frontier Sandstone and in flats along southern part of map area. Maximum thickness is about 4,400 ft in nearby Mellen Hill quadrangle (Cullins, 1969)

Kmf **Frontier Sandstone**—Upper part is resistant, light-olive-gray, fine-grained, calcareous and fossiliferous sandstone. Lower part is brown and pale-blue, fissile shale and siltstone. Frontier is well exposed and forms first hogback north of U.S. Highway 40, along southern limb of Skull Creek Monocline. Thickness ranges from 200 to 250 ft

Kmy **Mowry Shale**—Blue-gray to pale-blue, fissile, siliceous shale and thin bentonite beds; locally contains gypsum. Weathers to distinctive hard chips. Contains fish scales. Thickness ranges from 60 to 90 ft

Kd **Dakota Sandstone (Lower Cretaceous)**—Resistant, yellowish-brown to light-gray, medium- to thick-bedded, medium- to coarse-grained sandstone interbedded with conglomerate and minor thin shale. Weathers reddish-brown and forms hogback along much of southern limb of monocline in southern part of quadrangle. Thickness ranges from 60 to 75 ft

Kcm **Cedar Mountain Formation (Lower Cretaceous)**—Comprises two members: an upper unnamed shale member and lower Buckhorn Conglomerate Member. Upper part consists of slope-forming, pale-olive and purple shale and mudstone units interbedded with thin, fine-grained sandstone and resistant, light-brownish-gray limestone containing red jasper near base. Buckhorn Conglomerate Member is ledge-forming, thick-bedded, medium-gray to light-gray conglomerate and fine- to coarse-grained sandstone; conglomerate is characterized by black chert pebbles. Thickness about 175 ft; thickens westward. Unconformable contact with Morrison Formation is placed below beds of chert-pebble conglomerate or red-jasper limestone

Jm **Morrison Formation (Upper Jurassic)**—Slope-forming, variegated pale-olive, dark-red, and reddish-brown siltstone, claystone, and shale interbedded with light-gray to olive-gray, fine- to medium-grained sandstone, conglomeratic sandstone, minor glauconitic sandstone, and argillaceous and nodular limestone. Conglomeratic sandstone about 30 ft thick occurs near middle of the Morrison and locally contains fossil dinosaur bones and teeth that weather out on dip slopes. Lowermost fine- to medium-grained sandstone is strongly crossbedded; basal eolian sandstone is well exposed in vicinity of Stinking Water Creek directly north of Blue Mountain, Colo. (southwest corner of map area). Elsewhere, crossbedded Morrison sandstone uncomformably overlies Redwater Member of Stump Formation. Thickness ranges from 560 to 650 ft

Jmmg **Beds at Martin Gap**—Ledge-forming, thick-bedded and cross-bedded, medium-gray to light-gray, very coarse grained sandstone and pebble conglomerate; lithology is similar to Buckhorn Conglomerate Member of Cedar Mountain Formation. Beds occur in lens that abruptly pinches out northwestward and southeastward within upper part of the Morrison. Interpreted as fluvial channel deposit within the Morrison. Thickness 0–50 ft

Stump Formation (Upper and Middle Jurassic)

Jsr **Redwater Member (Upper Jurassic)**—Light-gray and pale-olive glauconitic shale interlayered with siltstone, sandy limestone, coquina, and thin-bedded sandstone. Weathers to a greenish cast. Fossils include brachiopods, pelecypods, cephalopods (belemnites very common), and ammonites. Contact with Curtis Member distinct; located between soft green beds of the Redwater and indurated light-gray beds of the Curtis. Thickness ranges from 100 to 150 ft; usually well exposed at base of Curtis flatirons

Jsc **Curtis Member (Middle Jurassic)**—Very resistant, ledge-forming, light-gray to greenish-gray, fine- to coarse-grained, thin- to medium-crossbedded sandstone. Glauconite and fossils are common. "Trash" beds (as much as several feet thick) of petrified wood and other plant debris are common at base, locally containing copper and uranium minerals. Unconformable contact with Entrada Sandstone is sharp. Thickness variable, 0 to 30 ft

Je **Entrada Sandstone (Middle Jurassic)**—Resistant, light-gray, fine- to medium-grained, thick-bedded, massive sandstone; glauconitic in upper part. Where underlying Carmel Formation (unit Jca) is absent or very thin (generally east of Red Wash water gap) the Entrada–Glen Canyon contact is mapped along a topographic low between the two similar sandstone units. Thickness ranges from 90 to 150 ft

Jca **Carmel Formation (Middle Jurassic)**—Slope-forming, reddish-brown, fine-grained sandstone, siltstone, and mudstone. Redbeds of the Carmel display a striking contrast to eolian sandstone units above (Entrada sandstone, unit Je) and below (Glen Canyon sandstpme, unit Jg). The Carmel crops out around Moosehead Mountain and, in southwestern part of map area, as far east as Red Wash water gap; east of the water gap the Carmel is too thin (less than 5 ft thick) to map separately; it is located at contact between Entrada and Glen Canyon Sandstones. Contact with underlying Glen Canyon is mapped along color change from reddish-brown Carmel mudstones to light shades of gray of Glen Canyon Sandstone. Unit thins to east from about 50 ft in southwest to only a few feet east of Red Wash

Jg **Glen Canyon Sandstone (Lower Jurassic)**—Massive, thick-bedded, well-sorted, light-gray to grayish-pink, medium- to fine-grained sandstone. Exhibits medium-scale to very large scale sand-dune crossbedding. An unconformity lies about 10 ft below the Carmel–Glen Canyon contact, within lithologies similar to Glen Canyon Sandstone (Pipiringos and O'Sullivan, 1975). The unconformity is marked by a very thin (less than 1 in. thick) layer of chert pebbles. Is relatively resistant and weathers to rounded buttes. Exposed extensively around Skull Creek Monocline, forming the caprock of Skull Creek Rim. Thickness ranges from 600 to 700 ft

Trc **Chinle Formation (Upper Triassic)**—Includes main body and Gartra Member (not mapped separately) at base. Main body is slope-forming, moderate-red to moderate-pink siltstone interbedded with very fine grained sandstone units of similar color. Gartra Member is ledge-forming, light-gray, coarse-grained, conglomeratic sandstone; contains laminal, angular heavy-mineral clasts as large as 1 ft, petrified wood locally; is usually crossbedded. The Gartra forms a conspicuous brush-covered bench in otherwise relatively soft red cliffs around Skull Creek Monocline and ranges from 10 to 30 ft thick. Total thickness of Chinle ranges from about 250 to 300 ft. Unconformable contact with Moenkopi Formation is sharp

Trm **Moenkopi Formation (Middle? and Lower Triassic)**—Moderate-reddish-brown, yellowish-gray, and pale-olive micaceous siltstone interbedded with minor amounts of mudstone and very fine grained sandstone. Gypsum is common. Unconformable contact with Park City Formation, covered in most places, was mapped below lowermost beds of reddish-brown Moenkopi siltstone; color changes subtly from red Moenkopi to orangish Park City. Thickness ranges from 500 to 600 ft

Ppc **Park City Formation (Lower Permian)**—Alternating slope-forming, pale-orange and pale-olive mudstone and ledge-forming, indurated, yellowish-brown siltstone. Contains minor amounts of fine-grained, lenticular sandstone (some asphaltic); all lithologies are calcareous. The Park City is poorly exposed around Skull Creek Monocline, thought to be correlative with Franson Member (Hansen and Rowley, 1980). Possible unconformable contact with Weber Sandstone is marked locally by a 2-ft-thick conglomerate containing coarse quartz pebbles and angular rock fragments as large as 1 in. Thickness estimated at 150 ft

PIPw **Weber Sandstone (Lower Permian and Upper and Middle Pennsylvanian)**—Upper part is mainly light-gray, massive, thick-bedded, fine-grained sandstone except near top, where the sandstone is pale yellowish brown and slightly calcareous; large-scale crossbedding is common; several canyons locally expose 500–600 ft of sandstone at center of Skull Creek Dome. Lower part is highly indurated, interbedded light-gray (predominant) to pale-yellowish-orange, fine-grained, mostly thin bedded, commonly crossbedded, calcareous sandstone and light-gray, fine-grained, mostly thin bedded, commonly cherty, somewhat crossbedded, fossiliferous, locally sandy limestone; exposed in steeply dipping beds north of Wolf Creek Fault. Contact with Morgan Formation mapped at top of uppermost Morgan redbed. Reported to be about 1,000 ft thick about 6 mi northeast of quadrangle (Hansen, Carrara, and Rowley, 1980)

Morgan Formation (Middle Pennsylvanian)

IPmu **Upper member**—Ledge-forming, interbedded light- to moderate-red, fine-grained, crossbedded sandstone, gray to pale-lavender, cherty, fossiliferous limestone, and purplish-red siltstone. Pink to red chert nodules are conspicuous. Beds range from 2 to 10 ft thick. Breccia of red siltstone and limestone fragments occurs as float in upper part. Contact with lower member placed at break in slope at base of ledges formed by relatively hard limestone and sandstone units of upper member. Only upper part of member is exposed in northeast corner of map area. Hansen, Carrara, and Rowley (1980) reported member to be about 690 ft thick a few miles north of map area

IPml **Lower member**—Slope-forming, interbedded varicolored gray, red, and lavender shale and siltstone and minor grayish-pink to pale-lavender limestone and calcareous sandstone. Base not exposed in quadrangle; about 280 ft thick nearby (Hansen, Carrara, and Rowley, 1980)

Contact—Dashed where inferred

Normal fault—Bar and ball on downthrown side; dashed where inferred, dotted where concealed

Thrust fault—Sawteeth on upper plate; dotted where concealed

Glide faults—Open sawteeth on blocks of Cedar Mountain formation (unit Kcm)

Monocline—Showing trace of axial surface

Joint—Joints are mainly in Glen Canyon Sandstone

40 **Strike and dip of inclined beds**

Rock quarry

INTRODUCTION

The Lazy Y Point quadrangle lies along the southeastern edge of the Uinta Mountains about 15 mi north of Wrangle, Colo. The eastern part of Dinosaur National Monument is about 5 mi north of the quadrangle. The quadrangle contains the hogbacks and picturesque cliffs of the Skull Creek Rim, which can be seen from U.S. Highway 40. The southern part of the quadrangle contains large tracts of private land; the remainder is administered by the U.S. Bureau of Land Management. Access is limited to a single dirt road that runs north-northeast at the foot of the Skull Creek Rim and to a county road that runs east-west along the northern boundary.

The Lazy Y Point quadrangle contains the eastern one-third of the Willow Creek Wilderness Study Area and the western half of the Skull Creek Wilderness Study Area. The geology and mineral resources of the wilderness study areas and vicinity were mapped and assessed by Van Loenen and others (1990). Color aerial photographs, at a scale about 1:24,000, were used in making the map, and the geology was transferred from the photographs to the topographic base map using a photogrammetric plotter.

GEOLOGIC HISTORY

Rocks in the Lazy Y Point quadrangle range in age from about 300 million years old for the Morgan Formation (Middle Pennsylvanian) to about 30 million years old for the Bishop Conglomerate (Oligocene). The geologic history of these rocks began when the lower member of the Morgan formation was deposited along shorelines on older marine sediments (Rowley and Hansen, 1979b). They presently crop out only along the northern part of the quadrangle. During Middle Pennsylvanian and Early Permian time the Weber Sandstone was deposited over the Morgan. The Weber is chiefly shallow marine, intertidal, and eolian sandstone that was deposited in a trough in the ancestral Rocky Mountains. The Front Range and Uncompahgre Uplifts of the ancestral Rocky Mountains provided sediment to this region during late Paleozoic and part of Mesozoic time. This episode was marked by repeated rise and fall of sea level in response to ice ages in the Southern Hemisphere. The Weber is exposed in the northern part along the Wolf Creek Monocline and throughout the core of the Skull Creek Dome. Thick deposits of the Lower Permian Park City Formation accumulated to the west of the map area in marine and shelf environments, but deposits of the Park City in the Lazy Y Point quadrangle accumulated in very shallow water and possibly streams. Only the upper part of the Park City is present in this region (Rowley and Hansen, 1979b). The clastic redbeds of the Lower and Middle(?) Triassic rocks of the Moenkopi Formation were deposited in a desert environment by rivers and shallow marine seas. The basal conglomerate of the Upper Triassic Chinle Formation was deposited by braided streams on the eroded surface of the Moenkopi. This coarse material was later covered by the main body of the Chinle, a clastic redbed sequence of silts and sands deposited on alluvial plains. Eolian conditions returned to the region during the Early Jurassic, when dune sands of the Glen Canyon Sandstone covered the redbeds of the Chinle. The spectacular scenery of the Skull Creek Rim results from weathering of the soft Moenkopi and Chinle redbeds, which are preserved by the relatively hard overlying Glen Canyon Sandstone. The Glen Canyon forms the high plateau around the Skull Creek Dome. During the Middle Jurassic, mud and silt of the Carmel Formation were deposited in shallow marine conditions over much of the region. The Carmel thins from west to east and is a mappable unit only in the western parts of the quadrangle. Dune sands of the Entrada Sandstone (Middle Jurassic) covered the region before the sea again transgressed the area, depositing the Curtis Member of the Stump Formation. The Curtis is a thin but very hard sandstone that forms flatirons along the southern part of the map area.

Deep-water marine conditions existed during the Late Jurassic, and these deposits are represented by the Redwater Member of the Stump Formation. The sea again retreated, exposing a land surface that was covered with continental deposits of the Morrison Formation (Upper Jurassic). The Morrison includes fluvial, eolian, and possible lacustrine deposits. Following episodes of erosion, the Cedar Mountain Formation (Lower Cretaceous) and the overlying Dakota Sandstone (Upper Cretaceous), and the Upper Cretaceous Mancos Group were deposited along the shorelines and within the Western Interior Cretaceous Seaway. These are largely fluvial deposits that were later covered by thick marine deposits. Thin sandstone of the Castlegate represent the youngest Cretaceous sedimentary rock now present in the quadrangle.

The Laramide orogeny began near the end of the Cretaceous Period and is responsible for the Unita Anticline and other structural features present today. During Oligocene time (30 million years ago) fluvial deposits containing very coarse material covered parts of the quadrangle. Remnants of these deposits, called the Bishop Conglomerate, are preserved in the northern part of the quadrangle. Since Oligocene time, the area of the Lazy Y Point quadrangle has remained above sea level and exposed to erosion.

STRUCTURE

The predominant structural features in the Lazy Y Point quadrangle, from north to south, are the Wolf Creek Monocline, the Wolf Creek Monocline, the Wolf Creek Fault, and the Skull Creek Monocline. Asymmetrical folds, including monoclines, are common in the eastern Uinta Mountains and are considered to be formed above thrust faults (Rowley and Hansen, 1979a).

The Skull Creek Monocline is an east-west-trending structure that extends for about 30 mi from near the Utah-Colorado border across the quadrangle and ends about 8 mi to the east. The north limb of the monocline dips north at 2°–5°, and the south limb dips steeply south 25°–50°. Prominent hogbacks were formed by the erosion of steeply dipping beds of contrasting hardness. The Skull Creek Monocline forms an ellipsoidal dome, approximately 5 by 10 mi across (referred to as the "Skull Creek Dome"), and it extends into the adjoining quadrangle. The monocline overlies the Willow Creek Fault, a deep thrust fault that trends east-west just south of the map area. The Willow Creek Fault was encountered in a drill hole at a depth of 8,000 ft near Dinosaur National Monument headquarters, about 6 mi to the west, where Precambrian rock overlies Paleozoic rock (Powers, 1986).

The Wolf Creek Monocline extends east-west across the northern part of the Lazy Y Point quadrangle. It dips very gently (less than 5°) to the north and very steeply (vertical in places) along its southern limb. The monocline is broken by the Wolf Creek Fault, which has, for the most part, juxtaposed Weber and Moenkopi rocks at the surface. Unlike the blind Willow Creek Fault, the Wolf Creek is exposed at the surface.

In the east-central part of the map area, a system of northeast-trending faults cuts the Skull Creek Dome. Down-to-the-east displacement along the faults increases from northeast to southwest. The faults merge near the Red Wash re-entrant; from there they probably join a major fault mapped near Blue Mountain by Cullins (1969). Cullins (1969) and Powers (1986) suggested that the fault may be a surface manifestation of the Willow Creek Thrust.

Northeasterly and easterly trending joints have developed in the Glen Canyon Sandstone; some extend into older rock, but none is seen in younger rock. Joints are common in massive sandstone deposits such as the Glen Canyon.

MINERAL AND ENERGY RESOURCES

Little, if any, potential exists within the Lazy Y Point quadrangle for mineral or energy resources. Traces of metals are fault related in the southern part of the quadrangle. Formations within the quadrangle and nearby that contain traces of mainly uranium and copper include the Chinle, Stump, and Morrison Formations. The Weber Sandstone is a reservoir for oil and gas south of the quadrangle.

During the early uranium "boom" of the 1950's, small deposits of uranium and related minerals were discovered in several nearby localities. A very small amount of uranium was mined a few miles to the east (Van Loenen and Bryant, 1997), but similar deposits are not known in the Lazy Y Point quadrangle. Although few metals were available, favorable depositional conditions apparently existed in sandstone units where fossil plant remains served to localize mineralization. "Trash" beds, composed mainly of carbonized plant remains in mudstone and sandstone, served as a reductant for the mineralization.

The two primary targets for uranium exploration were the Gartra Member (the coarse basal conglomerate) of the Chinle and the sandstones of the Morrison Formation, both known throughout the west for their rich deposits of uranium. Petrified wood fragments, fossil dinosaur bones, and some sandstone beds in the Morrison Formation are slightly radioactive, as is the conglomerate at the base of the Chinle; however, these levels of radioactivity are not considered anomalous for either formation. The Curtis Member of the Stump Formation also contains traces of uranium, vanadium, and copper in this area. This mineralization is readily recognized as a distinctive copper bloom (blue) in the rock; most sites have been explored in prospect pits.

Altered rock associated with the large faults that cut the Glen Canyon and Entrada Sandstones in the Rock Wall Draw area contain trace amounts of silver, arsenic, copper, lead, and zinc (Van Loenen, and others, 1990). Prospect pits in this altered rock indicate that the occurrence of metals was already known here.

An oil and gas interest in this region is due to a similarity in geologic setting to the nearby Rangley oil field, which lies about 15 mi to the south. The principal reservoir rock in the Rangley field is the Middle Pennsylvanian to Lower Permian Weber Sandstone, which traps oil in a large monocline very similar to the Skull Creek Monocline. Although the Weber is present in a structural setting similar to that in the Rangley field, it has very little potential within the Lazy Y Point quadrangle because erosion has removed most of the Mesozoic and Cenozoic cap rock from the Skull Creek Monocline, thus exposing the Weber and allowing any oil and gas accumulations to escape. Several wells have been drilled in the quadrangle and nearby to test the Weber and lower Paleozoic rock, but with little success.

Other reservoirs for oil and gas in this region are foreland subthrust traps. The Willow Creek Fault, which lies beneath the southern boundary of the quadrangle, has been an exploration target for this kind of trap. Powers (1986) analyzed the play from seismic data and from a drill hole located about 6 mi to the west of the Lazy Y Point quadrangle. Oil was found, but the amount of closure beneath the subthrust is too small and the reservoir rock qualities too poor to contain commercial quantities of oil, (Powers, 1986). This play has not been tested by drilling within the quadrangle.

Gravel is abundant in terrace and alluvial deposits in the southern part of the map area. Conglomerate and limestone from the Cedar Mountain Formation and shale from the Mowry Shale have been quarried within the Lazy Y Point quadrangle for use as road metal.

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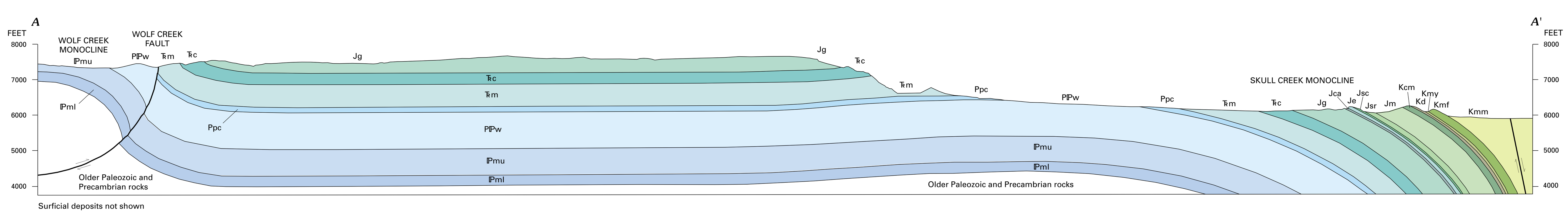

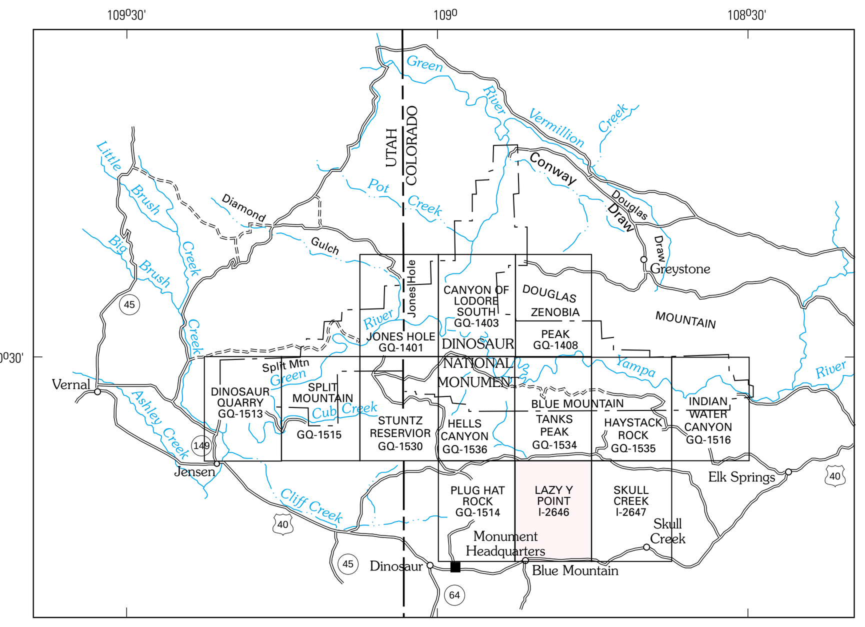

INDEX MAP SHOWING LOCATION OF THE LAZY Y POINT QUADRANGLE

Multiply	By	To obtain
inches (in.)	2.54	centimeters (cm)
feet (ft)	0.3048	meters (m)
miles (mi)	1.609	kilometers (km)

For sale by U.S. Geological Survey Information Services
Box 25286, Federal Center, Denver, CO 80225

This map was produced on request, directly from digital files, on an electronic plotter. It is also available as a PDF file at http://greenwood.cr.usgs.gov

GEOLOGIC MAP OF THE LAZY Y POINT QUADRANGLE, MOFFAT COUNTY, COLORADO

By

R.E. Van Loenen, Gary Selner, and W. Anthony Bryant

1999